

The opinion in support of the decision being entered today was not written for publication and is not binding precedent of the Board.

Paper No. 34

UNITED STATES PATENT AND TRADEMARK OFFICE

**BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES**

Ex parte GERALD J. JULIEN and RONALD H. BONDY

Appeal No. 2001-1372
Application No. 08/018,841

ON BRIEF

Before COHEN, FRANKFORT and BAHR, Administrative Patent Judges.
BAHR, Administrative Patent Judge.

DECISION ON APPEAL

This is a decision on appeal from the examiner's refusal to allow claims 15-19, 30, 31, 33, 34, 37-39, 46-53 and 55-58. Claims 10-14, 32, 40-45, 54 and 59 stand withdrawn from consideration pursuant to 37 CFR § 1.142(b) and claims 1-9, 20-24, 35 and 36 have been indicated allowable. Claims 25-29 have been canceled. The

amendments filed subsequent to the final rejection (Paper Nos. 19 and 23) have not been entered.¹

BACKGROUND

The appellants' invention relates to projectiles comprising shape memory alloys. A copy of the claims under appeal is set forth in the appendix to the appellants' brief.

The examiner relied upon the following prior art reference in rejecting the appealed claims:

Davis, Jr. (Davis)	4,704,968	Nov. 10, 1987
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The following rejections are before us for review.²

Claims 30, 31, 33, 34, 37-39, 46-53 and 55-58 stand rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which appellants regard as their invention.

Claims 15-19, 30, 31, 33, 34, 37-39 and 51-53 stand rejected under 35 U.S.C. § 102(b) as being anticipated by or, in the alternative, under 35 U.S.C. § 103(a) as being unpatentable over Davis.

¹ Issue A in the appeal brief is directed to the propriety of the examiner's refusal to enter the amendments after final. That issue is reviewable by petition under 37 CFR § 1.181 and is not within the jurisdiction of the Board. *In re Mindick*, 371 F.2d 892, 894, 152 USPQ 566, 568 (CCPA 1967). In this regard, we note that appellants' petitions (Paper Nos. 21 and 26½) from the non-entry of these amendments have been denied in decisions mailed July 20, 1996 (Paper No. 22) and November 25, 1996 (unnumbered).

² The examiner has withdrawn the new matter objection, the rejection under 35 U.S.C. § 112, first paragraph, the rejections of claims 1-6, 8, 9 and 55-58 under 35 U.S.C. §§ 102 and 103 and the rejection of claim 19 under 35 U.S.C. § 112, second paragraph (answer, page 2).

Rather than reiterate the conflicting viewpoints advanced by the examiner and the appellants regarding the above-noted rejections, we make reference to the answer (Paper No. 27) for the examiner's complete reasoning in support of the rejections and to the brief (Paper No. 24) for the appellants' arguments thereagainst.

OPINION

In reaching our decision in this appeal, we have given careful consideration to the appellants' specification and claims, to the Davis patent, to the Popoff affidavit (Paper No. 16), and to the respective positions articulated by the appellants and the examiner. Having reviewed all of the evidence before us, we make the determinations which follow.

The indefiniteness rejection

Several of the examiner's criticisms of the claims on appeal arise from the use of relative terms, or terms of degree, therein. Appellants are correct that terms of degree are permitted in claims and do not necessarily render claims indefinite. When a word of degree is used, such as the term "relatively" in claim 30, it is necessary to determine whether the specification provides some standard for measuring that degree. See Seattle Box Company, Inc. v. Industrial Crating & Packing, Inc., 731 F.2d 818, 826, 221 USPQ 568, 573-74 (Fed. Cir. 1984). Thus, in deciding this appeal, for each of the

terms of degree cited by the examiner, we shall review appellants' specification to determine whether it provides some standard for measuring that degree.

Claims 30 and 51 recite a shape memory alloy in a “**relatively soft** martensitic state” (emphasis ours). We note that appellants' specification discloses on page 8 that “[t]he bullet 30 is soft when inserted in the [breach] 46.” We find no indication in appellants' specification, however, of what degree of hardness is considered “soft” as used in claims 30 and 51. Even if we interpret “soft” in claims 30 and 51 as meaning low yield strength and consider appellants' specification to define low yield strength as a yield strength of 8 KSI (page 7, line 25) or less than 8 KSI (page 6, line 25), appellants' specification provides no standards for determining the scope of “**relatively soft**.” Furthermore, the recitations in claims 15 and 37 of an initial yield strength of 20 KSI and 15 KSI³, respectively, which are seemingly inconsistent with the designation in the remainder of appellants' specification of low yield strength as less than about 8 KSI, raise additional questions as to what is meant by “soft,” “relatively soft” and “low strength.” Therefore, we share the examiner's view that, in this instance, the terminology “relatively soft” renders claims 30 and 51, as well as claims 31, 33 and 34 which depend from claim 30 and claims 52 and 53 which depend from claim 51, indefinite. In that “said low strength martensitic material” in claims 30 and 51 and “said

³ While these initial yield strength recitations find support in original claims 15 and 37, the seeming inconsistency with the designation on pages 6 and 7 of a low yield strength as less than about 8 KSI is perplexing and is deserving of some clarification.

soft yield strength” in claim 34 appear⁴ to refer back to the “relatively soft martensitic state,” these terms are likewise indefinite.

We reach a similar conclusion with respect to the terminology “ultra-high strength stress-induced martensitic state” in claim 30 and “ultra-high strength stress-induced state” in claim 51. The terminology “ultra high strength martensitic state” is used in the last full paragraph on page 7 of appellants’ specification but is not defined or quantified therein. In our view, appellants’ specification (page 6, line 27; page 13, line 7) and claims 15 and 37 indicate that ultimate yield strengths above 200 KSI or 250 KSI or higher upon impact are desirable and contemplated within the scope of appellants’ invention. It is not clear, however, which, if either, of these ranges is considered an “ultra-high strength” as used in claims 30 and 51. While we might speculate that a strength above 200 KSI is a high yield strength and a strength of 250 KSI or higher is an “ultra-high” strength as used in appellants’ claims, we also cannot rule out the possibility that the disclosure and recitation of two different ranges is a matter of inadvertence on appellants’ part and that any strength above 200 KSI is considered “ultra-high.” Without clear guidance in the specification as to what constitutes an “ultra-high” strength, we agree with the examiner that this language renders the scope of

⁴ The inconsistency in language (e.g., “relatively soft,” “low strength” and “soft yield strength”) throughout the claims raises questions as to whether the later allusions to strengths refer back to the “relatively soft martensitic state.”

claims 30 and 51, as well as claims 31, 33 and 34 which depend from claim 30 and claims 52 and 53 which depend from claim 51, indefinite.

Having reviewed appellants' specification and found no standard for determining what constitutes "a high modulus of toughness"⁵ as used in claim 37, we agree with the examiner that this terminology renders the scope of claim 37, as well as claims 38 and 39 which depend therefrom, indefinite. The terminology "extremely strong and tough strain-induced state" likewise renders claim 46, as well as claims 47-50 which depend from claim 46, indefinite.

In that appellants' specification provides no clear standards for determining what degree of softness is required to constitute a "soft Martensite state," as discussed above, this terminology in claim 46 is indefinite. While the omission of the term "state" after "Martensite" in the last paragraph of claim 46 does not further render the claim indefinite, we agree with the examiner that this informality is deserving of correction.

For the foregoing reasons, we shall sustain the examiner's indefiniteness rejection of claims 30, 31, 33, 34, 37-39 and 46-53 under the second paragraph of 35 U.S.C. § 112.

⁵ Appellants' specification merely mentions on page 13 that the Nitinol material has a "remarkable toughness, or resistance to cracking," but does not provide any standards for determining the degree of toughness required consistent with appellants' invention.

As appellants have not contested the examiner's observations with regard to the lack of antecedent basis for "said indexing device on said insert" in claim 48⁶ and "said launcher" in claim 55, and the redundancy of the language of claim 49 with language in claim 46 from which claim 49 indirectly depends, we shall sustain the examiner's indefiniteness rejection of claims 48-50 and 55-58 on these bases as well.

In summary, the examiner's rejection of claims 30, 31, 33, 34, 37-39, 46-53 and 55-58 under the second paragraph of 35 U.S.C. § 112 is sustained.

The Prior Art Rejections

In light of our determination, *supra*, that claims 30, 31, 33, 34, 37-39 and 51-53 are indefinite, any consideration of the patentability of these claims under 35 U.S.C. § 102 or 103 would necessarily require speculation as to the meaning of the claims. Rejections under 35 U.S.C. § 102 or 103 should not be based upon "considerable speculation as to the meaning of the terms employed and assumptions as to the scope of the claims." In re Steele, 305 F.2d 859, 862, 134 USPQ 292, 295 (CCPA 1962). When no reasonably definite meaning can be ascribed to certain terms in a claim, the subject matter does not become obvious, but rather the claim becomes indefinite. In re Wilson, 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970). Accordingly, we are constrained to reverse the rejections of these claims as being anticipated by or

⁶ The "accompanying Amendment" referred to on page 6 of the brief has not been entered and thus cannot cure the defect noted by the examiner.

unpatentable over Davis. It should be understood, however, that our decision in this regard is based solely on the indefiniteness of the claimed subject matter, and does not reflect on the adequacy of the prior art evidence applied in support of the rejection.

Turning now to the examiner's rejections of claims 15-19 as being anticipated by or unpatentable over Davis, independent claim 15 reads as follows:

15. A method of propelling a high velocity, high accuracy projectile toward a target, comprising:
 inserting a projectile made of a shape memory alloy material into the [breech] of a rifled bore of a gun barrel, said projectile having an initial yield strength of less than 20 KSI which increases to an ultimate yield strength of greater than 200 KSI when subjected to about 2% cold-work;
 generating a high pressure gas volume in said [breech] behind said projectile;
 propelling said projectile axially along said rifled bore;
 forming helical grooves in said projectile by interference of said projectile and said rifling in said bore;
 and
 spinning said projectile by interaction of said high pressure gas volume in said bore behind said projectile and said rifling in said grooves in said projectile.

Davis discloses a projectile made of a shape memory alloy, such as 55 Nitinol, or including a shape memory alloy deforming means, which undergoes an instantaneous change in shape upon impact with a target. As explained by Davis (column 6, lines 44-52), the shape memory alloy has a martensitic state and an austenitic state and the projectile or deforming means is deformed while the alloy is in its martensitic state into

an initial shape and then launched toward a target. A temperature rise due to the impact triggers a phase transition of the alloy from its martensitic state to its austenitic state, thereby causing the projectile or its deforming means to recover to its non-deformed shape. As also noted by Davis (column 3, lines 26-27), the shape memory alloy is considerably stronger in its austenitic state than in its martensitic state. Davis discloses that the use of voids in the shape memory alloy portions of the projectile is “useful” in all embodiments of the invention in order to enhance the speed of recovery of the component by rapidly generating heat upon impact due to the collapse of the voids being shocked (column 3, lines 60-64; column 4, lines 8-12). Davis also teaches that “[i]t is understood that any of the embodiments discussed heretofore may also be fabricated from shape-memory alloy containing voids” (column 8, line 68, to column 9, line 3).

Appellants do not dispute that Davis teaches inserting the projectile into the breech of a rifled bore, generating a high pressure gas volume in the breech behind the projectile, propelling the projectile axially along the rifled bore, forming helical grooves in the projectile by interference of the projectile with the rifling and spinning the projectile by interaction of the high pressure gas volume in the bore behind the projectile and the rifling in the grooves of the projectile. Rather, appellants’ only arguments with respect to claim 15 appear to be that (1) Davis teaches using projectiles in a prestrained

condition before and during propulsion through the gun barrel and all the way to the target (brief, page 13) and (2) Davis teaches the use of sintered powdered metal in which voids are provided in the material and such sintered powdered metal Nitinol does not possess the characteristics recited in the claim. In particular, appellants assert that the yield strength of Davis' sintered powdered metal Nitinol on cold working does not increase to over 200 KSI, but merely collapses, as intended by Davis (brief, pages 10 and 16).

Appellants' first argument with regard to the use of prestrained shape memory alloy material is not found persuasive because claim 15 does not preclude prestraining of the shape memory alloy material prior to insertion of the projectile into the barrel. It is well established that limitations not appearing in the claims cannot be relied upon for patentability. In re Self, 671 F.2d 1344, 1348, 213 USPQ 1, 5 (CCPA 1982).

With regard to appellants' second argument, the examiner contends that it is clear from Davis' teachings that projectiles including shape memory alloy components without voids can be used and that the projectiles of Davis formed of a shape memory alloy in a solid form without voids inherently possess the same characteristics and dimensions as appellants' claimed projectile (answer, page 5). In the alternative, the examiner takes the position that, if the Davis projectiles do not possess the same characteristics and dimensions as appellants' claimed projectile, it would have been obvious to one having ordinary skill in the art at the time the invention was made to vary

the characteristics and dimensions of the Davis projectiles “to achieve an optimum result” (answer, page 6).

In light of the fact that Davis teaches the use of 55 Nitinol, the same material disclosed by appellants, as the shape memory alloy material for the projectile, it is our opinion that the examiner has met the initial burden of providing a basis to reasonably support the determination that the yield strength characteristics recited in claim 15 are possessed by the shape memory alloy material of Davis’ projectile so as to shift the burden to appellants to prove that the shape memory alloy material of Davis does not possess these characteristics. See In re King, 801 F.2d 1324, 1327, 231 USPQ 136, 138 (Fed. Cir. 1986).

As support for their position that Davis teaches the use of sintered powdered shape memory alloy material having voids, appellants rely on the affidavit of Alexis A. Popoff (Paper No. 16). In section 5 of the affidavit, affiant states a *belief* that the Davis patent “purports to teach a person of ordinary skill in the art to use sintered powdered metal Nitinol elements in a projectile, or make an entire projectile of sintered powdered metal Nitinol.” While it is true that Davis teaches that voids are useful in all embodiments of the invention disclosed therein to enhance the speed of recovery of the component, as discussed *supra*, the Popoff affidavit overlooks two important points with regard to Davis’ disclosure. First, Davis merely cites powdered metallurgy as one illustrative technique for forming a shape memory alloy projectile or deforming means

with voids and further points out that “[o]ther methods of creating voids are well known in the art” (column 4, lines 4-5). The Popoff affidavit does not address shape memory alloy components formed with voids via other known techniques in accordance with Davis’ teachings or offer any rationale as to why such components would not inherently possess the yield strength characteristics recited in claim 15. Second, while Davis teaches that voids are useful and that the utilization of components of shape memory alloy having voids is within the scope of the invention, we, like the examiner, find that Davis’ disclosure (column 9, lines 1-3) that “any of the embodiments discussed heretofore **may** also be fabricated from shape-memory alloy containing voids” (emphasis ours) would have conveyed to one skilled in the art that, while the provision of voids in the shape memory alloy component will enhance its speed of recovery upon impact, projectiles having shape memory alloy components not provided with voids are also within the scope of the invention disclosed therein.⁷ The Popoff affidavit does not offer any rationale as to why a 55 Nitinol shape memory alloy material without voids would not possess the yield strength characteristics recited in claim 15. Rather, all of the reasoning offered in the Popoff affidavit to support the position that the shape memory alloy material of Davis’ projectile does not possess these characteristics is

⁷ In this regard, we also observe that none of the independent claims in the Davis patent requires voids. In fact, dependent claim 9 is the only claim which calls for voids in the deforming means.

premised on affiant's belief that Davis' teachings are limited to sintered shape memory alloy components.

For the foregoing reasons, appellants' argument and evidence are insufficient to persuade us that the subject matter of claim 15 is not anticipated by Davis. Thus, the examiner's rejection of claim 15 under 35 U.S.C. § 102(b) as being anticipated by Davis is sustained. A disclosure that anticipates under 35 U.S.C. § 102 also renders the claim unpatentable under 35 U.S.C. § 103, for "anticipation is the epitome of obviousness." Jones v. Hardy, 727 F.2d 1524, 1529, 220 USPQ 1021, 1025 (Fed. Cir. 1984). See also In re Fracalossi, 681 F.2d 792, 794, 215 USPQ 569, 571 (CCPA 1982); In re Pearson, 494 F.2d 1399, 1402, 181 USPQ 641, 644 (CCPA 1974). Thus, on this basis, the examiner's rejection of claim 15 under 35 U.S.C. § 103 is also sustained. Furthermore, even if Davis does not expressly disclose projectiles having shape memory alloy components without voids, the permissive language in lines 1-3 of column 9 of the Davis patent would have suggested to one of ordinary skill in the art the use of such components. Thus, the examiner's obviousness rejection of claim 15 is sustained on this basis as well.

Appellants' sole argument with regard to the examiner's rejections of dependent claim 16 is directed to sintered powdered metal Nitinol (see brief, page 16). For the reasons discussed *supra*, we find this argument unpersuasive. We therefore sustain

the examiner's rejections of claim 16 as being anticipated by Davis and as being unpatentable over Davis.

With regard to dependent claims 17-19, appellants correctly point out that Davis provides no teaching of sealing the projectile in the bore to prevent blowby, sizing the projectile to tightly engage the bore or cold working the projectile in land regions to thereby transform the land regions from an initial low yield strength condition to a yield strength condition more than 10 times stronger than the initial low yield strength condition. Thus, we cannot sustain the examiner's rejection of these claims under 35 U.S.C. § 102 as being anticipated⁸ by Davis.

We shall sustain the examiner's rejection of claims 17 and 18 as being unpatentable over Davis. We find that one of ordinary skill in the art of projectiles such as bullets and weapon barrels would have understood the desirability, if not necessity, of minimizing blowby of the propulsion pressure used to launch the projectile from the weapon bore, as well as the desirability of sizing the projectile so as to contact the rifling on the bore of the barrel to achieve the spinning effect for which rifles are known in the prior art.⁹ It would thus have been obvious to one of ordinary skill in the art to size the projectile of Davis as closely as possible to the inner diameter of the bore of

⁸ Anticipation is established only when a single prior art reference discloses, expressly or under the principles of inherency, each and every element of a claimed invention. RCA Corp. v. Applied Digital Data Sys., Inc., 730 F.2d 1440, 1444, 221 USPQ 385, 388 (Fed. Cir. 1984).

⁹ In an obviousness assessment, skill is presumed on the part of the artisan, rather than the lack thereof. In re Sovish, 769 F.2d 738, 743, 226 USPQ 771, 774 (Fed. Cir. 1985).

the barrel so as to tightly engage and seal against the bore to minimize blowby of propulsion pressure generated behind the projectile and to engage the rifling in the bore so as to achieve the spinning effect for which rifles are known. Therefore, it is our opinion that the subject matter of claims 17 and 18 would have been obvious to one of ordinary skill in the art from the teachings of Davis.

We shall not, however, sustain the rejection of claim 19 as being unpatentable over Davis. Quite simply, we find no teaching or suggestion in Davis to cold work the projectile so as to achieve the more than ten-fold increase in yield strength as called for in the claim and the examiner has not explained why this would have been obvious.¹⁰

CONCLUSION

To summarize, the decision of the examiner to reject claims 30, 31, 33, 34, 37-39, 46-53 and 55-58 under 35 U.S.C. § 112, second paragraph, is affirmed. The examiner's decision to reject claims 15-19, 30, 31, 33, 34, 37-39 and 51-53 under 35 U.S.C. § 102 is reversed as to claims 17-19, 30, 31, 33, 34, 37-39 and 51-53 and affirmed as to claims 15 and 16. The examiner's decision to reject claims 15-19, 30,

¹⁰ In establishing a *prima facie* case of obviousness, it is incumbent upon the examiner to provide a reason why one of ordinary skill in the art would have been led to modify a prior art reference or to combine reference teachings to arrive at the claimed invention. See *Ex parte Clapp*, 227 USPQ 972, 973 (Bd. Pat. App. & Int. 1985). To this end, the requisite motivation must stem from some teaching, suggestion or inference in the prior art as a whole or from the knowledge generally available to one of ordinary skill in the art and not from the appellant's disclosure. See, e.g., *Uniroyal, Inc. v. Rudkin-Wiley Corp.*, 837 F.2d 1044, 1052, 5 USPQ2d 1434, 1439 (Fed. Cir.), cert. denied, 488 U.S. 825 (1988).

31, 33, 34, 37-39 and 51-53 under 35 U.S.C. § 103 is reversed as to claims 19, 30, 31, 33, 34, 37-39 and 51-53 and affirmed as to claims 15-18.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 CFR § 1.136(a).

AFFIRMED-IN-PART

IRWIN CHARLES COHEN
Administrative Patent Judge

CHARLES E. FRANKFORT
Administrative Patent Judge

JENNIFER D. BAHR
Administrative Patent Judge

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Appeal No. 2001-1372
Application No. 08/018,841

Page 17

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